

# CONCRETE SECTION JOINT APPARATUS AND METHOD

## FIELD OF THE INVENTION

5 This invention relates to pre-formed concrete sections, and apparatus and method for connecting pre-formed concrete sections.

## BACKGROUND OF THE INVENTION

Pre-formed concrete sections are used in the construction industry to simplify and economize the building process. These pre-formed sections are often formed at a remote  
10 location away from a building site, and then shipped to the building site to be installed in the structure. One example of a pre-formed section is a concrete section commonly referred to as a "double-tee." A double-tee generally includes a flat deck and two support beam legs extending below the deck. The section is called a double-tee because the cross-sectional view of the section resembles two T's connected side-by-side. A double-tee may often be used to  
15 construct parking ramps, bridges, floors, or other structures that may require a relatively strong and durable surface and a large amount of usable surface area. For example, in a parking ramp, the double tee may support the weight of several cars parked on top of the double-tee.

## SUMMARY OF THE INVENTION

20 The present invention provides a concrete section comprising a first end, a second end disposed opposite the first end, and a length extending between the first and second ends. A first side extends along the length of the section from about the first end to about the second end. A first edge extends along the first side of the concrete section for connecting the  
25 concrete section to an adjoining concrete section. The first edge is formed from a plastic material and may be at least partially embedded in the concrete section. The concrete section may also include a second side disposed opposite the first side and extending along the length of the section from about the first end to about the second end of the concrete section. A second edge may be at least partially embedded in the concrete section and extend along the  
30 second side. The second edge is also formed from a plastic material.

In some aspects and in some constructions, the edge comprises a lateral portion and an extension extending into the concrete section from the lateral portion. An anchor portion is disposed at an end of the extension opposite the lateral portion and the anchor portion has a cross-sectional area greater than the cross-sectional area of the extension. The edge includes  
5 an exposed face facing away from the section and a concealed face facing towards the section and contacting the concrete. A flexible layer may be disposed between the concealed face and the concrete. The edge may have a cross-section that remains substantially the same as it extends along the length of the concrete section.

A first concrete section and a second concrete section may be connected to one  
10 another to form a platform. The first concrete section has the first edge at least partially embedded in the first side, and the second concrete section has the second edge at least partially embedded in the second side. The first and second concrete sections are positioned adjacent one another with the first and second edges being elongated and relatively straight and extending adjacent one another. The first and second edges are substantially evenly  
15 spaced from one another along the sections. The first and second edges are formed from a plastic material. A joint may be formed between the edges to connect the sections. A continuous weld is formed between the first and second edges and extends along the length of the edges and connects the first section to the second section. The weld is formed from a semi-flexible plastic material extending between the edges, and the weld may form a seal  
20 between the first and second edges that resists material from passing between the sections.

Independent features and independent advantages of the present invention will become apparent to those skilled in the art upon review of the following detailed description, claims and drawings.

## 25 **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is an end view of a concrete section embodying aspects of the invention.

Fig. 2 is a perspective view of an assembly of multiple concrete sections illustrated in  
Fig. 1.

Fig. 3 is a perspective view of an assembly of multiple concrete sections illustrated in  
30 Fig. 1.

Fig. 4 is an enlarged end view of a joint of the assembly of multiple concrete sections of Fig. 2.

Fig. 5 is an end view of a concrete section having an edge embodying aspects of the invention.

5 Fig. 6 is an end view of the edge of Fig. 5.

Fig. 7 is an end view of a concrete sections having edges embodying aspects of the invention.

Fig. 8 is an enlarged view of the concrete sections and edges of Fig. 7.

Before any embodiments of the invention are explained in detail, it is to be understood  
10 that the invention is not limited in its application to the details of construction and the arrangements of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

15 Although references may be made below to directions, such as left, right, up, down, top, bottom, front, rear, back, etc., in describing the drawings, these references are made relative to the drawings (as normally viewed) for convenience. These directions are not intended to be taken literally or limit the present invention in any form.

## 20 DETAILED DESCRIPTION

Fig. 1 illustrates a pre-formed concrete section 10 comprising a deck 14 and a first leg 18 and a second leg 22 projecting from the deck 14. In the illustrated construction, the concrete section 10 includes a form of pre-formed concrete commonly referred to as a “double-tee”. The deck 14 extends from a first end 26 to a second end 30 (Fig. 2) opposite the  
25 first end 26, and a length extends between the first and second ends 26, 30. The deck 14 includes a first side 34, a second side 38 opposite the first side 34, and a width extending between the first and second sides 34, 38. The deck 14 also includes a top surface 42, a bottom surface 46 opposite the top surface 42, and a thickness extending between the top and bottom surfaces 42, 46. In the illustrated construction, the top surface 42 of the deck 14  
30 generally lies in a single plane.

The first leg 18 and the second leg 22 project from the bottom surface 46 of the deck 14 and each leg 18, 22 extends substantially along the entire length of the deck 14. As shown in Fig. 1, the legs 18, 22 are tapered such that they narrow as they extend away from the deck 14.

5           The deck 14 includes a first outer portion or flange 50, a second outer portion or flange 54, and a central portion 58. The first outer portion or flange 50 extends outwardly from the first leg 18 toward the first side 34 and extends substantially along the entire length of the deck 14. The second outer portion or flange 54 extends from the second leg 22 toward the second side 38 and extends along the length of the deck 14. In the illustrated construction, the  
10          second outer portion 54 is substantially a mirror image of the first outer portion 50. The central portion 58 is disposed between the first and second legs 18, 22 near the middle of the deck 14. The central portion 58 extends along a portion of the width of the deck 14 and substantially along the entire length of the deck 14.

          In the illustrated construction, the top surface 42 of the deck 14 is substantially co-  
15          planar across the first outer portion or flange 50, the second outer portion or flange 54, and the central portion 58. In some aspects and in some constructions, the top surface 42 and the bottom surface 46 may be substantially parallel, and the deck 14 may have a substantially uniform thickness. In some aspects and in some constructions, the bottom surface 46 of the deck 14 may not be co-planar across these portions 50, 54, 58 and the top surface 42 and the  
20          bottom surface may not be parallel. The thickness from the top surface 42 to the bottoms surface 46 may vary across these portions 50, 54, 58.

          A first edge or plastic edge 70 is at least partially embedded in the concrete section 10 and extends along the first side 34 from the first end 26 to the second end 30. The first edge 70 is disposed along the side of the first outer portion 50 opposite the first leg 18. The first  
25          edge 70 may have a cross-section that remains substantially the same as the first edge 70 extends along the length of the first side 34. A second edge 74 is at partially embedded in the concrete section 10 and extends along the second side 38 from the first end 26 to the second end 30. The second edge 74 is disposed along the side of the second outer portion 54 opposite the second leg 22. The first and second edges 70, 74 are both made from elongated lengths of  
30          plastic material. In some aspects and in some constructions, the plastic material may include a thermoplastic material, or other similar weldable plastic materials. The plastic material may

also include a high density polyethylene (or HDPE) or other similar plastic materials.

However, it should be understood that the edges 70, 74 are not limited to these types of plastic materials and may include other plastic materials.

5 The first and second edges 70, 74 may be used to connect two adjoining concrete sections 10 to one another to form a platform. Fig. 2 illustrates an assembly of multiple concrete sections comprising two concrete sections 10 positioned adjacent one another. Each concrete section has a first and second edge 70, 74 extending along the respective first and second sides 34, 38 of the concrete sections 10. The sections 10 are positioned next to one another such that the second edge 74 of one section is aligned adjacent the first edge 70 of the  
10 other section.

Fig. 3 illustrates an expanded view of the assembly of multiple concrete sections. A weld strip 78 connects the adjacent second edge 74 and first edge 70 and forms a joint 82 that connects the two sections 10. The joint 82 extends substantially along the length of the sections 10 to form a continuous connection between the sections 10. The weld strip 78 is  
15 formed from a plastic material and may be semi-flexible. In some aspects and in some constructions, the plastic material may include a thermoplastic material, or other similar weldable plastic materials. The plastic material may also include a high density polyethylene (or HDPE) or other similar plastic materials. However, it should be understood that the weld strip 78 is not limited to these types of plastic materials and may include other plastic  
20 materials.

The concrete sections 10 are positioned adjacent one another with the respective first and second edge 70, 74 aligned with one another. The weld strip 78 is positioned between the edges 70, 74 to weld the edges 70, 74 together. The weld strip 78 is heated with a heat source and at least partially melts or deforms to connect the first and second edges 70, 74. The heat  
25 source fuses the weld strip 78 to the first and second edges 70, 74. The heat source proceeds along the length of the sections 10 to continuously connect the edges 70, 74. When the heat source is removed, the weld strip 78 and edges 70, 74 are cooled and harden as a continuous joint 82 between the first and second edges 70, 74.

The joint 82 provides both a firm connection and a seal between the adjoining concrete  
30 sections 10. The joint 82 resists the sections 10 from moving with respect to one another, and provides stability for a platform formed from multiple concrete sections 10. The joint 82 may

also form a seal between the sections 10. The seal may be substantially water-tight and resist water or other particles from passing between the sections 10. Therefore, the weld 78 between the first and second sections 70, 74 may form a single joint 82 that is both a connection and a seal between the sections.

5            Fig. 4 illustrates an enlarged view of the joint 82 between the sections 10. In the illustrated construction, the first and second edges 70, 74 are substantially the same and are mirror images of one another. The first edge 70 will be described in detail, and common elements of the second edge will be identified by the same reference number “”.

            The first and second edges 70, 74 are preforms laid into the mold for the concrete.

10          The concrete is cast so that the edge is embedded in the side of the concrete. The first edge 70 comprises a lateral portion 86 extending along the first side 34 and an extension 90 extending into the first side 34 of the concrete section 10 from the lateral portion 86. The extension 90 includes an anchor portion 94 disposed at an end of the extension 90 opposite the lateral portion 86. In the illustrated construction, the anchor portion 94 has a cross-sectional area  
15          greater than the cross-sectional area of the extension 90. The first edge 70 may be integrally formed and the lateral portion 86, extension 90 and anchor portion 94 all may form a single unitary piece.

            The extension 90 and anchor portion 94 extend into the concrete section 10 to help prevent the first edge 70 from separating from the first side 34. The first edge 70 is generally  
20          made from a plastic material may not bond to the concrete of the section 10. When the first edge 70 is connected to the second edge 74 with the weld 78, the first and second edge 70, 74 may be exposed to forces that attempt to pull the edges 70, 74 in a direction away from their respective sides 34, 38. The anchor portion 94 resists these forces to keep the edges 70, 74 fixed in relation to their respective sides 34, 38. The anchor portion 94 includes a shoulder  
25          that engages the concrete. When a force attempts to separate the first edge 70 from the first side 34, the shoulder of the anchor portion 94 engages the concrete and prevents the edge 70 from moving away from the side 34.

            In the construction shown in Fig. 4, the first edge 70 includes dove-tail portions 102 to help retain the first edge 70 to the first side 34. The dove-tail portions 102 include an  
30          elongated channel 106 that extends along the length of the first edge 70. The elongated channel 106 has a generally trapezoidal cross-sectional shape with an opening 110 and a base

114, in which the base 114 is wider than the opening 110. The elongated channel 106 forms an interlocking tongue-and-groove engagement with the concrete section 10 with at least a portion of the concrete disposed within the elongated channel 106. The wider base 114 helps prevent the concrete within the channel 106 from passing through the opening 110 and permitting the first edge 70 to separate from the first side 34.

The lateral portion 86 of the first edge 70 includes an exposed face 118 facing away from the first side 34 and a concealed face 122 facing toward the first side 34 and contacting the first side 34. In the illustrated construction, the elongated channel 106 is defined by the concealed face 122.

The first edge 70 also includes a top portion 126, a bottom portion 130 disposed opposite the top portion 126. As shown in Fig. 4, the top portion 126 of the first edge 70 is recessed from the top surface 42 of the concrete section 10. The weld 78 between the first and second edges 70, 74 is also recessed from the top surface 42. The top surface 42 of both the adjacent concrete sections are generally co-planar with one another. The recessed top portion 42 permits the first and second edges 70, 74 and the weld 78 to be positioned below the top surfaces 42 and to not extend beyond the top surfaces 42. The recessed top portion 42 and weld 78 define a recessed groove between connected concrete sections. Therefore, the top surfaces 42 of multiple connected concrete sections 10 may form a continuous platform that is not interrupted by bumps from the weld 78.

Figs. 5-6 illustrate another construction of a first edge 150 for a concrete section 10. Similar to the construction described above, the first edge 150 extends along the first side 34 of the concrete section 10, and a similar second edge may extend along the second side of the concrete section 10. Fig. 5 illustrates the first edge 150 embedded in the concrete section 10, and Fig. 5 illustrates the first edge 150 alone without the concrete section. The first edge 150 includes a lateral portion 154, and extension 158 extending from the lateral portion 154, and an anchor portion 162 disposed at the end of the extension 158 opposite the lateral portion 154. The first edge 154 also includes an exposed face 166 facing away from the first side 34 and a concealed face 170 disposed opposite the exposed face 166 facing toward the first side 34. The first edge 154 also includes a top portion 174, a bottom portion 178 disposed opposite the top portion 174.

As shown in Fig. 5, the first edge 150 includes a flexible layer 182 disposed between the concealed face 170 and the first side 34. The flexible layer 182 includes a compressible material and helps accommodate for expansion or contraction of the concrete section 10 and first edge 150. In some aspects and in some constructions, the flexible layer 182 may include adhesives to bond the flexible layer 182 to the concrete section 10 and/or first edge 150.

In the illustrated construction, the first edge 150 includes a removable edge 186 disposed adjacent the top portion 174 of the first edge 150 and extending along the length of the first edge 150. The removable strip 186 is positioned near the intersection of the first side 34 and the top surface 42 of the concrete section 10. The removable strip 186 may be peeled away from the first edge 150. A groove is exposed along the intersection of the first side 34 and the top surface 42 when the removable strip 186 is removed from the concrete section 10.

When making the concrete section 10 having the first edge 150, the first edge 150 is provided first and the concrete section 10 is cast or formed around the first edge 150. The removable strip 186 preserves space for the groove during formation of the concrete section 10. In general, the first edge 150 is placed within the cavity for the pre-formed concrete section along a side and the cavity is then filled with concrete. The concrete hardens and forms around the first edge 150, and also forms around the extension 158 and anchor portion 162. The removable strip 186 occupies the space that will eventually be the groove and prevents the concrete from forming in this space. Once the concrete has hardened and formed around the first edge 150, the removable strip 186 may be removed to expose the groove. As described above, the recessed groove permits the weld to be formed below the top surfaces of the concrete sections.

Figs. 7-8 illustrate another construction for a first edge 190 and a second edge 194 for concrete sections. The first edge 190 includes a lateral portion 198 connected to the first side 34 and extending along the length of the concrete section 10. The first edge 190 also includes a recessed top portion 202 disposed below the top surface 42 of the concrete section 10. The recessed top portion 202 at least partially defines a groove between the adjacent concrete sections 10. In the illustrated construction, the first edge 190 does not include an extension of an anchor portion extending into the concrete section 10. The first edge 190 may be bonded to the concrete section, may be adhered, or another similar fastening means may be used to connect the first edge to the concrete section 10.



The foregoing detailed description describes only a few of the many forms that the present invention can take, and should therefore be taken as illustrative rather than limiting. It is only the claims, including all equivalents that are intended to define the scope of the invention.